Dry spells and evidence for scaling of agricultural water management and smallholder irrigation in northern Ghana

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Key messages

- ✓ Dry spells due to climate variability within the growing season reduce maize yield by up to 25%, requiring about 150 mm supplementary irrigation
- ✓ In situ water harvesting during the raining season increase yield by 50%
- ✓ Dry season water application of 50-75% of crop water requirement generates 70-90% of potential yield for tomato, onion and pepper.
- ✓ Dry season irrigation to maximise income and water use require right equipment for access and distribution of water , as well as the need for information on water demand and market prices

Objectives and approach

- Objective: Exploring sustainable agricultural water management solutions and opportunities for scaling to attain benefits in yields and income for the smallholder farmer.
- Approach: (i) Analysing incidence of dry spell occurrence and the impacts on major commodities in northern Ghana. (ii) Evaluating technological interventions for mitigating dry spell and maximizing dry season irrigation production.

Key results

- There is 60-80% chance of a dry spell exceeding 7 days and 30-40% chance of a dry spell exceeding 10 days in northern Ghana (Fig. 1)
- Shorter dry spells (7 -10 days) can be overcome by infield water harvesting such as tied ridges and contours for moisture availability (Fig.2). For maize, use of tied ridge increase yield and crop water productivity by about 60% over the control.
- Longer dry spells (14-21 days) in the rainy season require supplementary irrigation from surface water (dugouts, reservoirs) and groundwater.
- Dry season irrigation gives best productivity (kg yield m^{-3} water applied) with a well scheduled water application of 50-75% of crop requirement, resulting in 70-90% of potential yield for typical high value crops such as tomato, onion and pepper. (Fig. 3)
- Drip irrigation and the use of wetting front detectors for scheduling water application can enhance water use efficiency during dry season irrigation from groundwater (Fig 4)
- Lack of investment in land or water management option was considered (by 90% of 138 farmers) as the most risky response to rainfall variability in the region, farmers are willing to invest.
- Market potential exist for forage and vegetables during the dry season but gains are guaranteed through timely harvesting, to take advantage of local and regional price fluctuations.

Significance and scaling potential

Market potential and access to water for vegetables during the dry season can provide additional income of $200- $800 for smallholder farmers. In the northern zone, over 10,000 vegetable farmers can benefit, but constraints such as poor access to water, imported irrigation equipment's (drip kits solar, fuel or electric pumps) and other irrigation services must be addressed. Providing farmers with information for water use and scheduling as well as market prices, will optimize water use and farmers income.

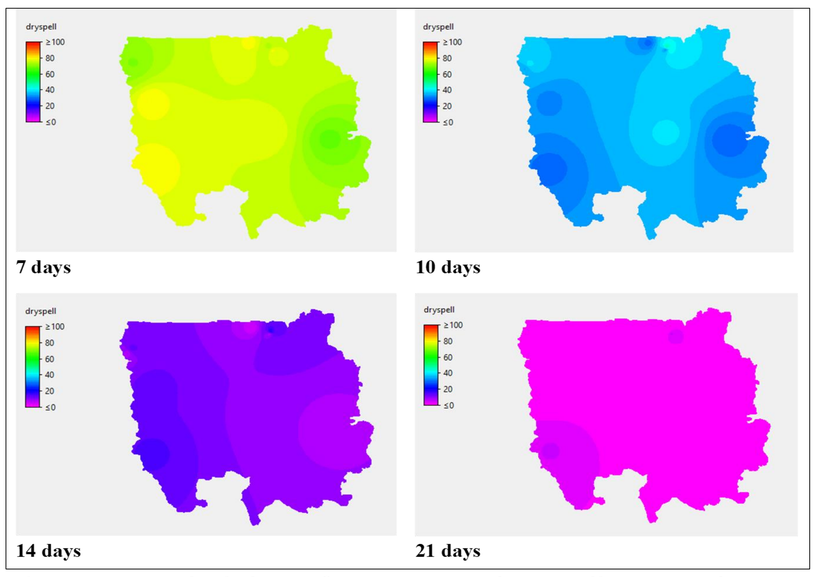

Figure 1. Probability of maximum dry spells exceeding 7, 10, 14 and 21 days over northern Ghana for a 90-day season

Figure 2. Tied ridges capture rainwater at farmer's field (left) compared to adjacent field of conventional raised beds (right)

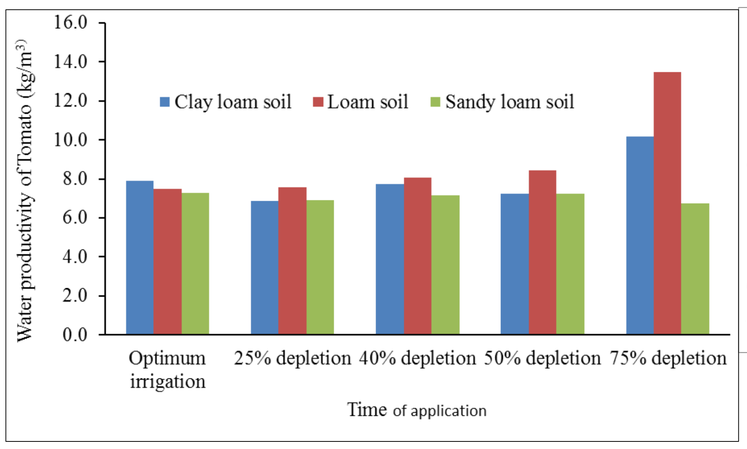

Figure 3. Water productivity of irrigated tomato at different levels of soil moisture depletion in three soil types

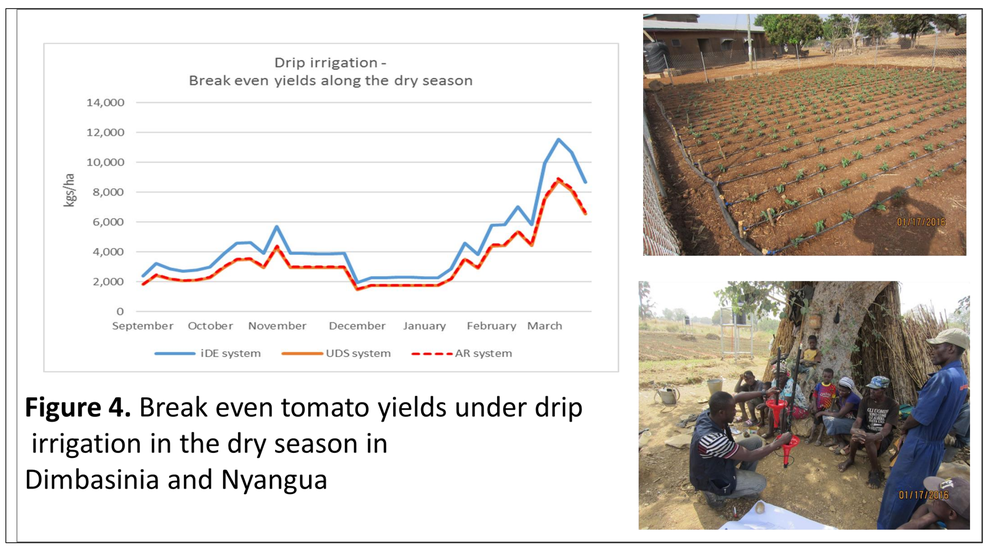

Figure 4. Break even tomato yields under drip irrigation in the dry season in Dimbasinia and Nyangua

Partners

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